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# Worldwide Report

ENVIRONMENTAL QUALITY

No. 354



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# WORLDWIDE REPORT ENVIRONMENTAL QUALITY

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## CONTENTS

### EAST EUROPE

#### POLAND

- Urban Pollution Case Study Analyzed  
(Roman Janusiewicz; Bogdan Terekoczy; CZASOPISMO  
GEOGRAFICZNE, Jul-Sep 81) ..... 1
- Environmental Protection System Assessed  
(GOSPODARKA PLANOWA, Oct 82) ..... 16
- Certain Problems, by Mirosław Gorczyca  
Planning System, by Edward Sitek

### LATIN AMERICA

#### MEXICO

- ERRATUM: Chichonal Volcanic Ash Floating Toward Tuxtla  
Gutierrez  
(A. Garza Morales; EXCELSIOR, 14 Apr 82)..... 43
- Communities Still Cut Off  
Status of Volcano Uncertain

### WEST EUROPE

#### FRANCE

- Strike at Water Purification Plant Hurts Paris Water Supply  
(Stephane Bugat; LE POINT, 5-11 Apr 82) ..... 46

## URBAN POLLUTION CASE STUDY ANALYZED

Warsaw CZASOPISMO GEOGRAFICZNE in Polish No 3, Jul-Sep 81 pp 297-311

[Article by Mgr Roman Janusiewicz of the Regional Geodetic-Cartographic Enterprise, Wroclaw, and Mgr Bogdan Terekoczy of the University of Wroclaw Geography Institute: "Selected Elements of Urban Environmental Hazards--a Case Study of Wroclaw"]

[Text] Summary. This article presents the state of Wroclaw's urban environment, analyzing its most significant pollutants and hazards. The article also attempts to classify the environment with regard to the concentration of harmful phenomena and evaluates the degree of pollution and danger.

Being a polyfunctional city, Wroclaw lends itself to reflection and analyses in the area of environmental science problems. The greatest threat to an urban environment occurs in the areas of air pollution, pollution of surface water and noise pollution, primarily transportation noise.

The aim of this article is to present the spatial and cartographic aspects of these phenomena based on measurements taken by the VSSE [Voivodship Health and Epidemiological Station] and the OBIKS [Center for Research and Control of the Environment] in Wroclaw. (MATERIALY OBIKS, 1976; MATERIALY VSSE, 1976).

### Air Pollution

The degree of air pollution is one of the main factors deciding the so-called comfort of urban living. An avalanchial increase in damage, linked with air pollution, occurs after established values of standards of concentrations of dusts and gases are exceeded, and by the long lasting effects of concentrations of pollutants caused by climatic-meteorological conditions.

Wroclaw's location on the wet terrains of the ancient floodwaters of the mid-Oder River and its tributaries shaped an unfavorable microclimate characterized by high humidity, low wind velocities and relatively large amounts of calm that consequently favor the occurrence and accumulation of pollutants. The layout of the streets has a significant effect on the city's unfavorable microclimate; they represent local paths for circulating street winds and at the same time intensify the saturation of the city with pollutants from about 700 industrial establishments.



As a result of the diagnoses conducted by the OBiKS, it has been established that the emissions from 121 of the city's industrial establishments, among which 36 are characterized as being especially heavy emitters, have a significant effect on air purity. The total amount of dust pollutants emitted in 1975 from enterprises known to be especially heavy emitters amounted to 20,242 t/yr (18,572 t of boiler plant dusts and 1,679 t of industrial dusts). In turn, the total amount of emitted gaseous pollutants amounted to 17,891 t/yr (14,889 t of sulfur dioxide and 3,002 t of other gases). (MATERIALY OBiKS, 1976).



Figure 1. Mean values of dust fallout in residential districts in 1976 in  $t/km^2/yr$



Figure 2. Mean daily values of dust concentrations in residential districts in 1976 in  $mg/m^2$

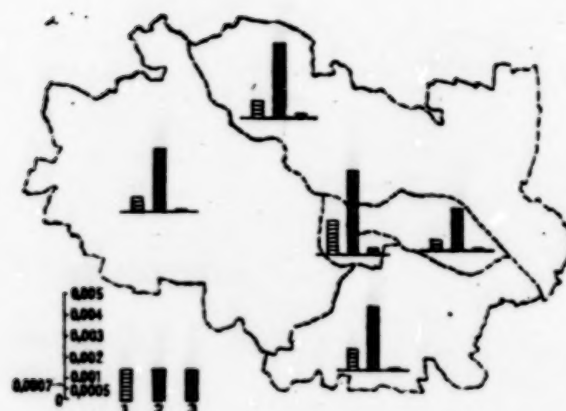


Figure 3. Mean daily concentrations of metals in residential districts in 1976 in mg/m<sup>2</sup>

Key:

1. lead
2. zinc
3. copper

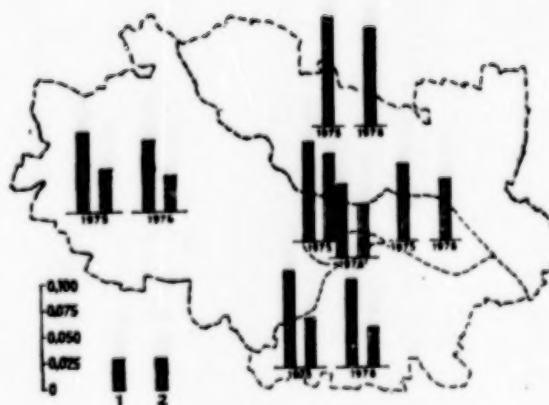


Figure 4. Mean daily values of SO<sub>2</sub> concentrations in residential districts in the 1975-1976 period in mg/m<sup>2</sup>

Key:

1. insulating method
2. aspirating method

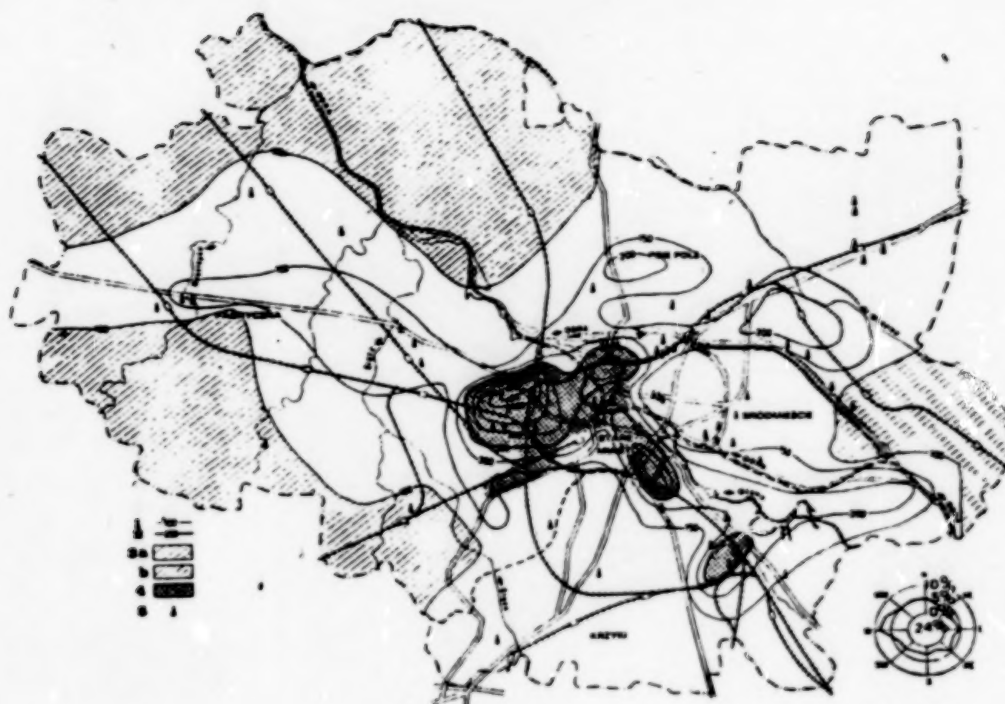


Figure 5. Map of air pollution, 1975 data.

Key:

1. dustfall in  $t/km^2/yr$
2. permissible dustfall for protected areas
3. clean air zones:
  - a. unthreatened
  - b. threatened
4. polluted air areas
5. Plants and boiler rooms emitting  $SO_2$  above  $30t/km^2/yr$

The spatial distribution of dust fallout in the Wroclaw region is unfavorable because the greatest dustiness occurs in the central residential districts which have a high population density (figure 5).

The fallout is especially intensive in the Stare Miastro district and the communities of Gadow Maly, Tarnogaj, Huby and around the area of the main railway depot. The dust fallout in these regions amounts to  $250-450 t/km^2/yr$ . The communities of Ligota, Kowale, Grabiszyn, Ksiaz Male and Popowice, where the dust fallout is  $200-250 t/km^2/yr$ , are also potentially threatened. The large number of sulfur dioxide emitters (emitting more than  $30t/yr$ ) in these regions intensifies the unfavorable situation. In the remaining communities dust fallout is within the limits of permissible norms.

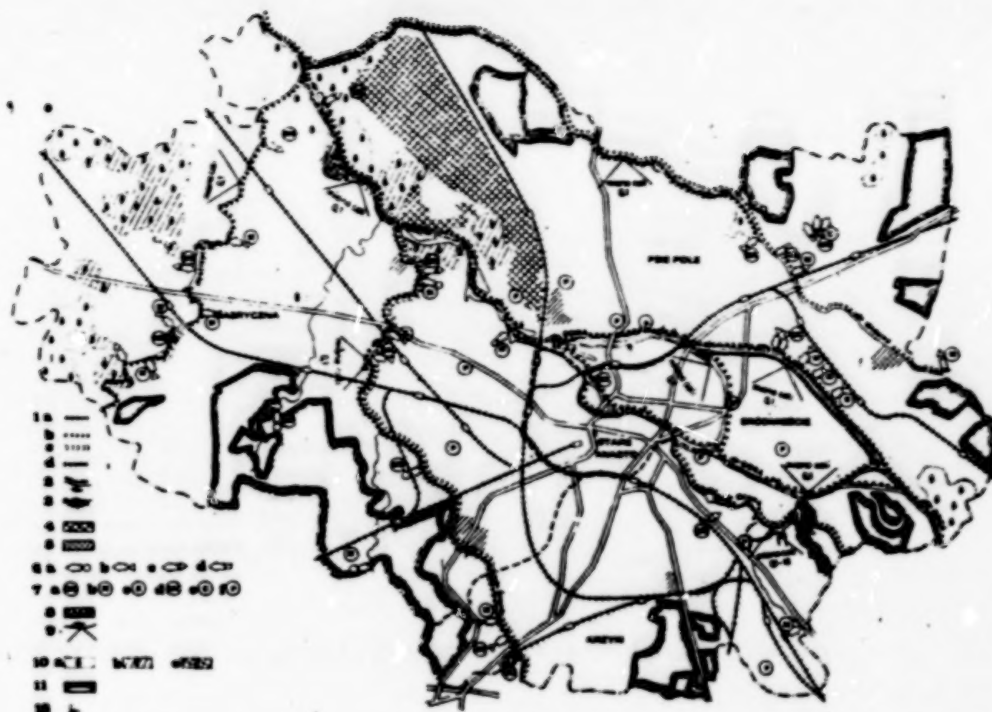


Figure 6. Map of water pollution, damaged vegetation and protected soils, 1976/1977 data.

Key:

1. Purity classes of surface waters:
  - a. class I
  - b. class II
  - c. class III
  - d. class IV
2. Purity classes of water in the periods preceeding and following the sugar-beet processing period
3. Purity classes of water during the sugar-beet processing period
4. Subsurface waters polluted by infiltration of sewage
5. Subsurface water zones polluted by municipal wastes, cemeteries and municipal dumps
6. Kinds of sewage:
  - a. residential
  - b. industrial
  - c. municipal
  - d. sanitary
7. Kinds of sewage treatment plants:
  - a. mechanical-biological
  - b. mechanical
  - c. biological
  - d. mechanical-chemical
  - e. chemical
  - f. sewage intermediate pumping stations.
8. Protective areas for water intakes
9. Microbiological contamination of surface waters, permanently strong-- coli test 0.1, moderate or periodical--coli test 0.1-10



Figure 6 key (continued):

10. Forests:
  - a. unthreatened
  - b. threatened
  - c. damaged
11. Legally protected class 1-4b soils
12. Storm drain outlets

There is a correlation between emitter heights and regions having especially large dust fallouts. The maximum value of dust fallout in the Gadow Maly, Szczepin and Popowice districts and around the main railway depot is the result of the many low emitters in these areas. This thesis is verified by the fact that electric power and heat generating plants which emit the greatest amount of dust do not intensify dustiness because of the great height of their emitters.

The communities of Oporow, Muchobor Wielki, Strachowice, Ratyn, Zlotniki, Pracze Ordzanskiw, Redzin and Widawa in the city's southwestern area are especially fortunate with respect to dust fallout (less than  $100\text{t}/\text{km}^2/\text{yr}$ ). The eastern areas of the city, including the communities of Wojnow and Swojczyce, also are subject to a fallout of less than  $100\text{t}/\text{km}^2/\text{yr}$ , but a potential threat exists here as a result of the pollutants brought into the area from the city's central area via the prevailing westerly winds.

#### Water Pollution

The inaccessibility of subsurface waters and their unfavorable hydrogeological system to a great extent mandate the use of surface water to satisfy municipal needs. However, those very streams that serve as sewage reservoirs also serve as water supply sources; this represents a basic problem for proper water management. The city's water is polluted by industrial, residential and sanitary sewage as well as surface run-offs from agricultural and built-up areas (figure 6).

Wroclaw lies in the hydrological region which encompasses the Oder River and four of its largest tributaries: the Olawa, Sleza, Bystrzyca and Widawa Rivers. Most of these streams are already polluted as they flow into the city. The situation is especially unfavorable during the sugar-beet processing period (table 1).

Table 1. The percentage share of purity class of the rivers within the limits of Wroclaw voivodship during the 1975 sugar-beet processing period and inter-period (according to MATERIALY OBİKS, 1976).

| River      | Purity class in percent            |    |     |    |                              |    |     |     |
|------------|------------------------------------|----|-----|----|------------------------------|----|-----|-----|
|            | Sugar-beet processing inter-period |    |     |    | Sugar-beet processing period |    |     |     |
|            | I                                  | II | III | IV | I                            | II | III | IV  |
| Oder River | --                                 | 5  | 80  | 15 | --                           | 20 | 60  | 20  |
| Olawa      | --                                 | 85 | 5   | 10 | --                           | 75 | 15  | 10  |
| Sleza      | --                                 | 40 | 50  | 10 | --                           | 3  | 57  | 40  |
| Bystrzyca  | --                                 | 40 | 60  | -- | --                           | -- | --  | 100 |
| Widawa     | 30                                 | 70 | --  | -- | 40                           | 40 | --  | 20  |

By the time it reaches Wroclaw's administrative boundaries, the Oder River carries a significant amount of pollutants, mainly from the Upper Silesia area and from the river's upper regions. Within the city's limits, the river's purity is class IV which, in effect, hinders its use in any way. Industrial, residential and sanitary sewage is dumped into it.

The class II purity Olawa River is the main source of drinking water for Wroclaw's inhabitants, but its quality evokes serious reservations, especially during the sugar-beet processing period. During the sugar-beet processing inter-period the permissible standards are exceeded fewer times and are caused primarily by the insufficiently treated industrial sewage that is dumped into the river and the effects of applying chemicals in agriculture.

During the sugar-beet processing inter-period the Sleza River is class II purity, and during the fall-winter period it is class IV. This is the result mainly of industrial (the Klecina sugar mill), residential and urban sewage discharge (MATERIALY OBİKS, 1976).

For its entire length within Wroclaw's limits, the Bystrzyca is class IV purity because of its large content of industrial and urban sewage.

During the sugar-beet processing inter-period, the Widawa River is class II purity as a result of urban and sanitary type pollutants. During the sugar-beet processing period, its waters, starting at the point of sewage discharge from the Soltysowice sugar mill, are class IV.

Wroclaw's municipal sewage is mechanically-biologically treated in sewage treatment plants and is also treated in irrigation fields. This permits a large amount of fodder to be harvested from the meadows of the irrigation fields. However, it poses a potential threat to subsurface waters because of the possibility of highly polluted sewage infiltration. Municipal dumps

and cemeteries also are a potential threat to subsurface waters. These areas can be sources of subsurface pollution because of the deep infiltration of harmful substances dissolved in the water. The pollution of subsurface water is more harmful than the pollution of surface water because the self-treatment of subsurface water takes a very long time.

A significant improvement in the purity of Wroclaw's water can be expected after the Odra collector is built, a top-priority municipal investment into which the city's entire sewage network will be connected in the future and whose output will be fed to a central sewage treatment plant (the so-called recycling of water).

#### Threatening and Destroying Vegetation

In urban areas green zones perform specific functions: they are neutral regions for mitigating the harmful effects of air pollution (a dust-absorbing role) and noise (an acoustic role). Properly shaped greenery also influences a city's climate by humidifying the air, alleviating high temperatures, modifying winds and the like. The role of greenery as a producer of oxygen and a place reserved for the rest and recreation of a city's inhabitants are also emphasized.

Wroclaw's urban greenery encompasses wooded areas, parks, squares, residential greenery, allotment gardens, cemeteries and the like. The relatively high index of greenery per resident is not conclusive for establishing the actual needs in this area because of the uneven distribution of greenery. In the city's existing spatial system, a number of regions are practically without large groups of tall greenery, the most important type from the viewpoint of diminishing the threat. The number of green areas is diminishing constantly because of residential construction, communal and road projects and the like.

The effect of motorization on the city's greenery and the growing movement for rest and recreation in outlying wooded areas are additional reasons why vegetation is being destroyed. However, the proximity of municipal dumps to green areas represents the relatively greatest threat (figure 6). The significant toxicity of these dumps devastates and destroys nearby vegetation.

#### Transportation Noise

To a great extent, the growth of urban transportation, private as well as public, has disturbed the equilibrium of the urban environment. In addition to the increasingly positive results of this growth, there are also its negative effects, especially noise and the problem of air pollution by exhaust gases. The simultaneous overlapping of these negative effects is especially dangerous.

As a result of Wroclaw's dynamic reconstruction during the post-war years which was based on the old transportation system, the city's faulty spatial-functional structure was preserved. The situation in the city center is especially unfavorable, where the greatest amount of traffic occurs brought about by the mixture of communal, industrial, residential and recreational-cultural functions and the like.

Measurements of transportation noise in Wroclaw were conducted fragmentarily and unsystematically. The results contained herein concern three basic types of transportation noise from the viewpoint of noxiousness: road, railway and aircraft. The evaluation of the intensity of road noise occurring in Wroclaw is based on measurements taken during the 1974-1975 period (average<sup>5</sup> and quasi-maximum<sup>6</sup> noise levels, table 2).

Table 2. Road noise ( $L_{gr}$  and  $L_{qm}$ ) during the 1974-1975 period (according to MATERIALY VSSE, 1976)

| Classes of noise level in<br>decibels (Amper) |               | Number of measuring points for a given<br>class |    |
|---|---------------|---|----|
| $L_{gr}$<br>A                                 | $L_{qm}$<br>B | A   | B  |
| Up to 55                                      | Up to 60      | 2   | 2  |
| 56-65   | 61-70         | 4   | 4  |
| 66-75   | 71-80         | 5   | 3  |
| 76-85   | 81-90         | 2   | 4  |
| Total value                                   |               | 13  | 13 |

The average intensity level of road noise in the city is  $L_{gr} = 65.7$  db(A), which is on the borderline of being bearable and aggravating, and  $L_{qm} = 72.8$  db(A) which is aggravating (table 3) (ZASADY I PARAMETRY ....., 1975).

Tram noise at turns, crossings and bridges is a significant contributor to Wroclaw's street noise. This noise is especially noxious on Treatralny and Grunwaldzki Squares; at the Uniwersytecki, Piaskowy, Mlynski, Warszawski and Pokoju Bridges; and on Traugutt Street (figure 7). "Chimney" dispersion of noise occurs in the Stare Miasto area, partly in the limits of the old buildings of the city center (Pulawski and Traugutt Streets) and in the Olbinie area because of the narrow streets, the poor condition of the pavements and the high buildings. As if it were not enough that the intense street noise in this area is not muted, it also is reflected from building walls--at the upper stories of houses--and then focused as noise of even greater intensity, even up to 9 db(A) (Ostaszewicz, 1977).



Table 3. The effect of noise on man's organism (obtained from various sources)

| Noise having a harmful effect on man's organism                               | db(A)                |
|---|----------------------|
|   | Greater than 85      |
|   | 80                   |
| Noise harmful to health when exerted constantly                               | 75 Unbearable noise  |
|   | 70 Aggravating noise |
|   | 65                   |
| Noise inducing fatigue in the nervous system, making sleep and rest difficult | 60 Bearable noise    |
|   | 55                   |
|   | 50                   |
|   | 45 Moderate noise    |
|   | 40                   |
|   | 35                   |
| Noise that is harmless to health  | Less than 30         |

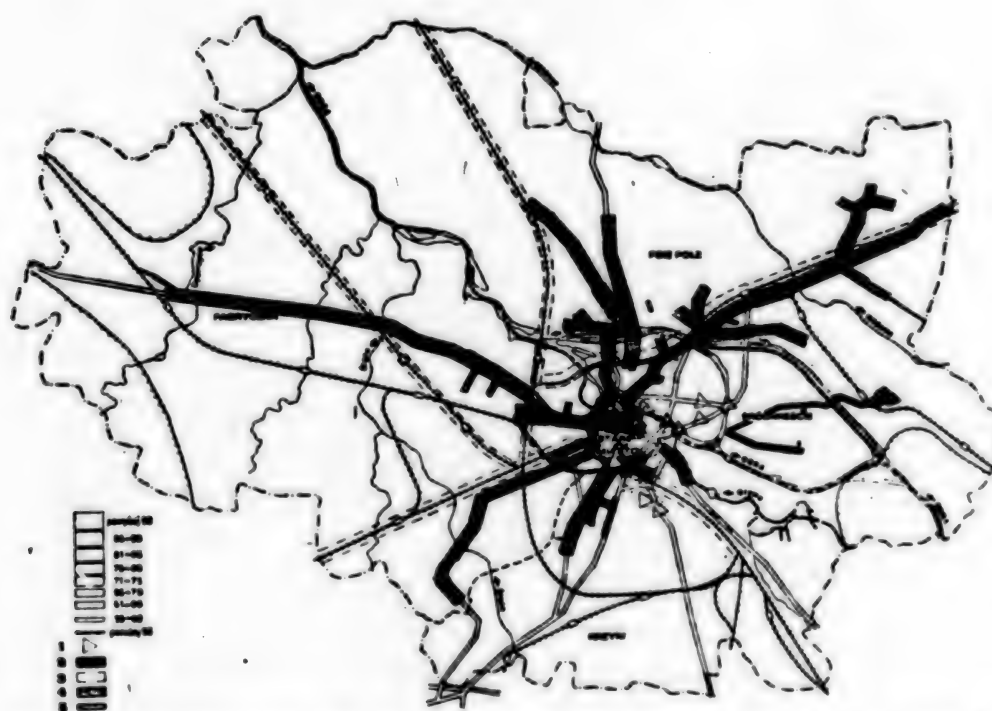


Figure 7. Map of distribution of transportation noise in db(A); data for the 1976-1977 period

Key:

1. Areas of intense tran noise
2. Car noise,  $L_{cm}$
3. Railway noise,  $L_{sr}$
4. Area with "chimney" distribution of noise
5. Quiet areas

The effect of railway noise is also very extensive. Wroclaw is one of the best developed railway junctions in Poland with heavy passenger and freight train traffic. In addition the railway tracks run through the central district, mainly on embankments, which increases the scope of this noise significantly. Based on measurements taken in 1976 along the railway lines near which homes are located, it has been ascertained that the average levels of intensity are  $L_{sr}(\min) = 70.8 \text{ db(A)}$ ,  $L_{sr}(\max) = 82.1 \text{ db(A)}$  and  $L_{sr}(sr) = 76.4 \text{ db(A)}$  which are acknowledged to be unbearable (table 4).

Table 4. Railway noise in 1976 (according to MATERIALY OBİKS, 1976)

| Noise level in db(A) | Number of measured points in a given class |          |            |
|----------------------|--|----------|------------|
|                      | $L_{\min}$                                 | $L_{gr}$ | $L_{\max}$ |
| Up to 55             | --   | --       | --         |
| 56-65                | 5  | 2        | 1          |
| 66-75                | 17   | 13       | 6          |
| 76-80                | 6  | 13       | 21         |
| Total                | 28   | 28       | 28         |

The areas near the airport, which is located in Wroclaw's southwestern suburbs in the community of Strachowice, are the prime regions for aircraft noise. Measurement results are presented in terms of average values of noise intensity for the entire series of measurements in specific localities. The average background noise level is  $L_{sr} = 42.3 \text{ db(A)}$  and stationary noise is  $L_{eq} = 61.3 \text{ db(A)}$  which is considered to be bearable noise (table 5).

The noxiousness of aircraft noise will be subject to a resurvey if the airport is moved as planned to the community of Szewic, 24 km north of the city center.

Table 5. Aircraft noise ( $L_{sr}$  and  $L_{eq}$ ) in 1976 (according to MATERIALY WSSE, 1976)

| Measuring station | Background noise<br>$L_{sr}$ in db(A) | Stationary noise<br>$L_{eq}$ in db(A) | Duration of $L_{eq}$<br>in minutes |
|-------------------|---------------------------------------|---------------------------------------|------------------------------------|
| 1                 | 44,3                                  | 64,6                                  | 34,3                               |
| 2                 | 41,6                                  | 61,8                                  | 26,4                               |
| 3                 | 41,1                                  | 57,6                                  | 25,5                               |

#### Zones of Concentration of Harmful Phenomena

One method of spatially distinguishing the environment of an urban area is to show the zones of concentration of harmful phenomena. This permits the degree

of usability of specific areas of a city to be established in order to determine which areas should be residential, industrial, recreational and so forth considering the current state of the environment.

Przy bonitacji [translation unknown] the environment of the city of Wroclaw, the system of classification according to Brykowicz and Waksmundzki (1971), as adapted to Wroclaw's conditions, was accepted. As a basis for including areas in specific zones, the following hierarchy of hazards was accepted:

- Air pollution: dust fallout, the emission of SO<sub>2</sub> and other noxious gases;
- Transportation noise;
- Surface and subsurface water pollution;
- Microbiological hazards;
- All other hazards.

In accordance with the named criteria, the following areas are classified as being in noxious zones: Gadow Maly, Szczepin, Grabiszyn and Kleczkow--having much dustiness, large SO<sub>2</sub> emissions and other gaseous emissions (Grabiszyn); noise considered to be unbearable and microbiological hazards--the region of the southern part of Tarnogaj; and Kowal--significant amounts of gaseous emissions, much dustiness.

The following areas are in the threatened zones: Psie Pola, Stary Miasto, Tarnogaj, Rozanek, the strip along B. Krzywousty Street, Klecin and the Redzin irrigation fields. The overlapping of various degrees of a number of threats is characteristic of these regions.

Areas located in zones that are slightly disturbed are: Opatowice, Wojnow, Swojczyc, Pawlowice, Widawa, Pracze Odrzanskie, Strachowice and Muchobor Wielki. These are regions where few dangers are occurring, causing the relatively smallest disturbance to the environment.

All other areas of the city are considered to be a disturbed zone having the largest area.

#### Conclusions

An integrated orientation of the totality of problems associated with evaluating Wroclaw's environment permits proper control of municipal space. A knowledge of the complex problem of threats is one of the elements that will be of help in implementing effective protective measures and at the same time modifying the environment.



Figure 8. Map of concentration zones of noxious phenomena

Key:

1. Noxious
2. Threatened
3. Disturbed
4. Slightly disturbed

As a result of the overall evaluation of the scope of pollution and dangers occurring in Wroclaw (figure 9), the average degree of noxiousness on the spatial scale of the city predominates. In case of close contact with ongoing threats, the degree of noxiousness increases from weak to average (and sporadically to strong) and from average to strong.

In the area of immediate improvements in the state of the environment, the following postulates should be realized: isolate noxious zones by means of green belts; centralize heat sources; build a central treatment plant for municipal and industrial sewage; improve the transportation system by eliminating transient traffic from the city center; and improve the flow of traffic and the condition of the street pavements.



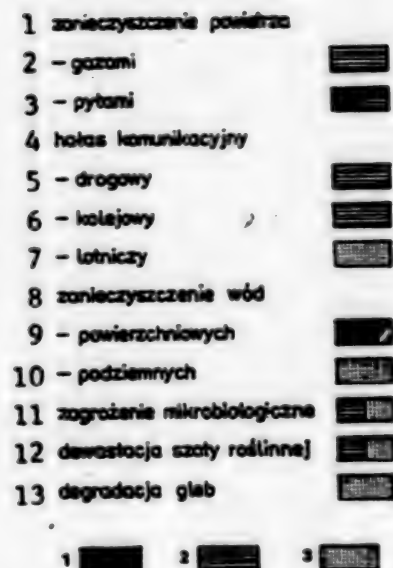


Figure 9. Degree of noxiousness of the main threats to Wrocław's environment on a city-wide scale (1--strong; 2--medium; 3--weak)

Key:

- |                         |                               |
|-------------------------|-------------------------------|
| 1. Air pollution        | 8. Water pollution            |
| 2. By gases             | 9. Surface                    |
| 3. By dusts             | 10. Subsurface                |
| 4. Transportation noise | 11. Microbiological threat    |
| 5. Road                 | 12. Devastation of vegetation |
| 6. Railway              | 13. Degradation of soil       |
| 7. Aircraft             |                               |

FOOTNOTES

1. According to Polish standards, the largest permissible mean daily concentration for protected areas are 0.35 mg/m<sup>2</sup> for sulfur dioxide, 0.001 mg/m<sup>2</sup> for lead, 0.02 mg/m<sup>2</sup> for zinc and 0.005 mg/m<sup>2</sup> for copper. In addition, the largest permissible mean dust fallout is 250 t/km<sup>2</sup>/yr and 0.2 mg/m<sup>2</sup>/day.

2. The insulating method is based on conducting air tests by filling special vessels with the air being tested. This method is used when the analysis method for the conducted air test is characterized by high sensitivity or when the concentration of the designated substance in the air is relatively high.

3. The aspirating method is based on passing a known volume of the air under test through a suitably selected liquid or solid absorbing substance (absorbents). The conducted air tests should continue until the designated substance becomes completely absorbed in the absorbent and the produced non-volatile compound reaches the proper concentration in the absorbent.

4. Surface water purity classes: I--water suitable for breeding salomoid fish; II--water suitable for community purposes; III--water suitable for industrial purposes; IV--water not meeting standards.
5. Mean noise level  $L_{sr} = L_{50}$  - mean statistical level defining the value of sound level that is exceeded during 50 percent of the observation time.
6. Quasi-maximum noise level  $L_{qm} = L_{10}$  - statistical level defining the value of sound level that is exceeded during 10 percent of the observation time.
7. Equivalent sound level; the mathematical value used to calculate the value of the periodically changing noise level.

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11899

CSO: 5000/3014

ENVIRONMENTAL PROTECTION SYSTEM ASSESSED

Certain Problems

Warsaw GOSPODARKA PLANOWA in Polish No 10, Oct 82 pp 444-449

[Article by Mirosław Gorczyca]

[Text] Economic activity must lead to the anthropogenic transformation of the natural environment. However, we must be concerned over how to minimize the damage done to it. The socialist socioeconomic system, whose primary goal as most generally conceived, is to serve the needs of society through the optimal use of available resources including environmental resources, is especially bound to implement the principle of the "compliance of production relations with the requirements of ecology."

The major factors determining the proper solution of environmental problems include:

--organizational-legal endeavors creating the framework of environmental policy; they make illegal and threaten sanctions against behavior that menace the qualities of the environment and the rational utilization of resources;

--technical and technological solutions serving the protection of the natural environment and the liquidation of violations arising therein;

--economic measures taken for the purpose of producing the proper motivation (together with punitive sanctions); these make the violation of environmental qualities unprofitable and the liquidation of their consequences profitable.

1. Protection of the environment has a recognized societywide scope in Poland. In the changes to the Constitution of the PRL [Polish People's Republic] that were resolved 10 September 1976, the environment was recognized as an all-national good, and the protection and development of the environment was recognized as a structural principle of the Constitution. Article 12, law 2 of the Constitution proclaims: "The Polish People's Republic ensures the protection and rational development of the natural environment, which represents an all-national good." Article 71 of the same law states: "Citizens of the PRL have the right to make use of the values

of the natural environment and the duty to protect it." Protection and the rational development of the environment are recognized as the sine qua non of the harmonious development of our country. A Experts' Team appointed in 1972 prepared the "Assumptions for a Program of Environmental Protection and Development" in our country up to 1990. The program assumptions comprise an evaluation of the current environmental situation are a forecast of changes in the environment. They likewise outline activities of a legal, organizational, scientific-research and technical nature indispensable for eliminating the consequences of pollution occurring to date, as well as ways to counteract the growing pressure on the environment resulting from the country's intensive economic development. The activities established for the program take into account the following basic principles of environmental protection policy:

--the policy of developing and protecting the environment represents an integral part of current state policy;

--he who conducts exploitative activity within the environment is responsible for its state;

--all industrial, municipal, agricultural and other structure, when becoming operational, must put into operation environmental protection equipment;

--modernization processes conducted in the national economy shall take into consideration the use of technology that is expedient from the viewpoint of environmental interests;

--the development of the domestic industry producing equipment for the needs of environmental protection and the development of the potential and specialization of contracting enterprises shall occur;

--research on the environment shall be expanded and the system of law shall be perfected;

--in the implementation of program assumptions, the total cooperation of all ministries, local authorities and society shall occur.

An all-Poland system of planning in environmental protection has been organized and is being perfected. Until recently this system took into consideration tasks in the area of marine and atmospheric protection. In the plan for the years 1976 through 1980, for the first time tasks in the field of the neutralization of industrial waste and soil recultivation have been separated. The principles, procedure and scope of planning have been prepared aimed at enabling units of the local administration to conduct the rational management of marine resources and pollution control.

2. The policy of environmental protection and conscious socioeconomic activity aimed at ensuring life in an unpolluted environment are reflected in legal regulations. They are legal-protective instruments serving the elimination of detrimental actions and stimulating action that fosters environmental protection. The legal regulation of environmental protection,



as a guiding element of the planned economy is executed in the form of standards having a varying range of influence and a hierarchy of legislative sources (the Constitution, laws, decrees and the like).

Legal questions of the protection and development of the environment and the rational utilization of its resources require a single, internally cohesive codification of legal standards. Until 1980, this demand was not fulfilled; particular legal documents at various levels of the legal hierarchy arose at different times. Under the conditions of diverse political and economic factors, these documents did not foster the creation of a system of uniform legal-protective instruments. The resolution by the PRL Sejm of a "Law Concerning the Protection and Development of the Environment" (a law dated 31 January 1980),\* fulfilled this demand. This law, together with over a dozen obligatory and optional executory regulations, created an internally cohesive, uniform system for codifying legal standards in the field of environmental protection.

The most important provision of the law, a more detailed interpretation of the entry in the PRL Constitution, is the statement that the "RL ensures the protection and the rational development of the environment, representing an all-national good, and it creates conditions fostering the realization of the right of a citizen to make universal use of environmental values." The provisions of the law concerning environmental protection and development became effective 1 September 1980. An especially vital provision of the law is the creation of the State Environmental Protection Inspectorate, subject to the Ministry of Administration, Local Economy and Environmental Protection, headed by the Main Inspector for environmental Protection. Moreover, the State Council on Environmental Protection was created as an advisory and opinion-rendering organ for the Council of Ministers.

The law places the natural resources of the environment under the special protection of the law. In order to serve socioeconomic needs, these resources "may be used exclusively within the scope established in national socioeconomic plans and in plans of territorial development, and in regulations on environmental protection" (article 4). Environmental protection is a vital element of state socioeconomic policy, and its needs are an integral part of planned socioeconomic tasks. Of the general principles of environmental protection and development, a statement contained in article 7, item 2 merits special attention. It states that "an administrative decision contradicting the requirements of environmental protection is invalid." Regarding this, there arises the fear that such contradiction may not always carry the consequences issuing from the law.

Practically speaking, the most important provisions of the law are found in section three (Realizing Environmental Protection, articles 64 to 73). These comprise the duties of organizational units and private persons in this area. They concern the principles of environmental protection in investment activity, restricting the use of environmental resources, and the conditions with which machinery and other mechanical equipment are to comply. These

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\*DZIENNIK USTAW, 1980, No 3, item 6.

articles point out that organizational units and private individuals conducting or intending to undertake economic activity that may be detrimental to the environment are obliged to use take measures ensuring its protection (article 64). This likewise applies to persons making use of the environment for purposes of tourism or recreation.

All participants in the investment process are obliged to abide by regulations concerning environmental protection. No "newly constructed or modernized construction project or groups of projects may be put into operation if the environmental protection equipment required by regulations or stipulated within the framework of the given investment is not executed" (article 68). Machinery, raw materials and domestically produced and imported fuels should comply with the requirements of environmental protection.

The failure to abide by rigorously stated requirements in the field of environmental protection threatens one with the responsibility for the consequences of violating the state of the environment. Persons guilty of neglect are subject to arrest, restriction of their freedom, a fine or a reprimand. Depending upon the degree of guilt and the consequences of the violations of environmental purity that have been committed, causing a possible threat to human life and health or being a possible cause of serious economic damage, the perpetrator may be subject to a penalty of imprisonment of up to 8 years.

3. The solution to environmental problems should be sought primarily through the creation of an effectively operating system of economic incentive inclining, or rather, forcing potential perpetrators of environmental violations to take the appropriate precautions to avoid them and to eliminate the consequences of existing destruction. Economic means of environmental protection are to serve in the solution of this problem in the form of charges made for the economic utilization of the environment and the introduction of changes into it. These fees are charged for the special utilization of waters, the introduction of pollutants into the atmosphere, removal of trees and the utilization of farmland and forested lands for other purposes and for the storage of waste.

Environmental protection requires an ample supply of funds. For this reason, the Environmental Protection Fund was established. It is designated for the implementation of investment tasks, for providing additional financing of social acts (e.g., afforestation), for activity associated with waste management and for other purposes emanating from the needs of environmental protection.

A reading of particular articles concerning environmental protection and development, in whose wake a number of executory regulations have appeared, arouses many ambivalent reflections. Doubtless, we should be happy that a legal document of such scope has appeared in our country, a document that will be a powerful instrument of environmental policy, provided that its provisions are obeyed. On the other hand, the functioning of this system (and not only of this system) indicates the fact that even the best legislation of regulations cannot be an adequate remedy. The matter reduces

itself to affording endeavors in the field of environmental development and protection the proper scope and to designating adequate outlays for them.

Fees for economic use of the environment and for changes made in it, introduced by stages, adjusted upward considerably and encompassing a broader and broader area of environmental values and advantages have been compulsory for several years in our country.

They are fees charged for: special usage of waters, the introduction of pollutants into the atmosphere, the removal of trees, the utilization of farmlands and forest lands for other purposes and the storage of waste.

Based on these charges and revenues from penalties imposed for failure to abide by the requirement of environmental protection, the Environmental Protection Fund has been established. Additional sources of income will be voluntary monetary and material-type contributions, as well as other income specified by the Council of Ministers. Monies from the fund will be used to cover the costs of endeavors in environmental protection or to provide additional financing for them. The amount of fees charged for economic use of the environment and fines imposed for failure to abide by the requirements of environmental protection, as well as authority regarding the procedure and collection of monies are defined in current executory regulations for the above-mentioned law concerning environmental protection and development, binding from 30 September 1980. The regulations of decrees concerning the above-mentioned fees and fines are applied toward organizational units or private individuals conducting economic activity. Organizational units and private individuals conducting economic activity incur charges primarily for: special usage of waters, the utilization of farmlands and forest lands for other purposes, the introduction of pollutants into the atmosphere, storage of waste in places designated for this purpose (in accordance with regulations concerning environmental protection against waste) and the removal of trees.

Fines are imposed for:

--atmospheric pollution exceeding the allowable types and amounts; for exceeding the allowable level of noise pollution as specified by a decision emanating from the regulations; for the removal of trees and shrubbery without the required approval of the local organ of the state administration at the primary level. The amount of fees and fines may be increased or decreased in relation to the obligatory rates in special cases specified by regulations.

4. The Central Office of Statistics [GUS] includes four types of outlays for environmental protection, namely investment outlays for: water management, water pollution control, air pollution control and the neutralization and management of industrial waste. This list is incomplete (e.g., it does not cover outlays for noise pollution control, radiation pollution control and the like).

In 1970, investment outlays for environmental protection amounted to more than 6.2 billion zlotys.\* This represented approximately 3 percent of combined investment outlays as well as 0.8 percent of the national income. They included outlays for water management (4.464 billion zlotys), water pollution control (1.23 billion zlotys) and air pollution control (5.4 billion zlotys). Beginning in 1975, GUS adds to this group of outlays investment outlays for equipment for the management and neutralization of solid waste. Table 1 contains the statistical data on this subject.

Table 1

Investment Outlays in the Field of Environmental Protection from 1975 to 1979

| <u>Item</u>   | <u>Years</u> |             |             |             |             |
|---|--------------|-------------|-------------|-------------|-------------|
|   | <u>1975</u>  | <u>1976</u> | <u>1977</u> | <u>1978</u> | <u>1979</u> |
| General investment outlays<br>(in billions of zlotys)<br>including (in percentages)<br>those for: | 12.953       | 19.185      | 21.180      | 21.920      | 19.817      |
| water management  | 59.9         | 63.8        | 60.4        | 65.6        | 66.9        |
| water pollution control   | 25.1         | 19.0        | 19.8        | 17.8        | 18.0        |
| air pollution control   | 8.9          | 10.2        | 13.4        | 8.8         | 7.1         |
| equipment for the neutralization<br>and management of solid waste                                 | 6.1          | 7.0         | 6.4         | 7.8         | 8.0         |

Our country, with its level of investment outlays for environmental protection insignificantly exceeding 1 percent of the national income (if we allow for those outlays not mentioned by GUS), departs unfavorably from the level of outlays in other countries. Among the most highly developed capitalist countries, corresponding outlays amount to more than 2 percent of the gross national product. Even if we do not allow for the considerably higher base, this represents a share about three-fold higher. In this context, the fact that outlays in this field are treated residually is particularly disturbing; this is expressed in the drastic limitation of outlays for the environmental-science infrastructure in recent years.

Examples from the past irrefutably attest to the fact that investment outlays in the field of environmental protection have had a very limited financial scope, and a still smaller material scope. The unfavorable investment situation that has occurred in recent years has affected outlays for the environmental-science infrastructure especially severely. It is these investments, which have always been treated in a residual way, that are subject to special restrictions as unproductive, and these that are easiest to

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\*In all cases, amounts are expressed in current prices.



defer. This has had the spectacular effect of drastically limiting investment outlays for water management, which amounted to more than 48 billion zlotys from 1971 to 1975 and somewhat less than 70 billion zlotys during the following 5-year period. If we allow for price changes and inflation, we see that not only did investments in this field not increase, but most likely diminished in volume. An especially dangerous occurrence of the drastic reduction in investment outlays took place in the area of the construction of sewage treatment plants, outlays for which were lower from 1976 to 1979 than in 1975, and were reduced by 15 percent from 1977 to 1979.

Likewise in the municipal economy, outlays for water investments and water pollution control were inadmissibly reduced. In 1979, they were only 0.7 billion zlotys higher than in 1976 (10.5 percent). Allowing for the increase in prices, this represents a severe reduction in the volume of investments. The reduced outlays had the effect of considerably reducing the volume of investment construction, extending investment cycles and causing a decline in material results. The lack of land development in water-supply and sewerage systems, the most indispensable equipment in the environmental-science infrastructure, not to mention sewage treatment plants, has become a serious barrier to the implementation of the housing program and is probably the major cause of the failure to execute housing construction plans from 1976 to 1980.

Great, highly overrated hopes were linked to the implementation of the "Wisla" program, whose total implementation was threatened in advance, not only because of the megalomaniacally unrealistic scope of endeavors, but primarily due to the lack of suitable investment-project completion potential. Data for the years 1966 through 1975 confirm this. If, during the 5-year period 1966 to 1970, treatment plants with a daily capacity of 4.1 million cubic meters were put into operation, and during the next 5-year period, plants with a daily capacity of 3.9 million cubic meters were put into operation, from 1976 to 1979, plants with a daily capacity of 1.6 million cubic meters were put into operation. Likewise, material outlays in other groups of water management investments declined, although not to this degree.

Each year Poland incurs severe losses because of flood damage; from 1971 to 1979, such damage was estimated at 22 billion zlotys, or approximately 2.5 billion zlotys per year. Some of these losses are unavoidable to a certain extent, since the construction of storage reservoirs, whose implementation and operation costs would exceed potential flood losses, would be unprofitable. However, as the bringing into cultivation of lands exposed to the consequences of periodic flooding increases losses grow, possibly reaching tens of billions of zlotys in the next few years.

Manmade water reservoirs play an important role in limiting flood losses, in addition to their numerous other roles emanating from the fact that they provide for unified water management (tourism, recreation, sports, the fishing economy and the like). According to the situation at the end of 1979, there were 84 manmade water areas in Poland with a total per-unit capacity of at least 1 million cubic meters of water, for a combined one-time storage

capacity of 2.7 billion cubic meters. These are generally old reservoirs, since only 10 manmade reservoirs for a combined capacity of approximately 0.4 billion cubic meters were built from 1971 to 1979. This is 2.5-fold less than during the 5-year period 1966 to 1970, confirming the regression observed in other groups of equipment in the environmental-science infrastructure.

In recent years, financial outlays for investments in the area of water management and water pollution control have shown an especially disturbing decline, e.g., from 18.3 billion zlotys in 1978 to 16.8 billion zlotys (in current prices) in 1979. There is the justifiable danger that, given conditions of a general economic recession, investments in the field of environmental protection will be most sharply curtailed. From year to year, monies from the Water Management Fund are not utilized. In 1979, less than 57 percent of the available funds were utilized. This was due to the lack of the processing capacity of construction.

Reductions in funding allocations have not bypassed investments in the area of air pollution control, which amounted to 540 million zlotys in 1970, 368 million zlotys in 1973 and 2.838 billion zlotys in 1977. In 1978, they were reduced to 1.941 billion zlotys, and in 1979 they amounted to only 1.402 billion zlotys. If we allow for the increase in prices of pollution control equipment and installation costs, the magnitude of the cutback occurring here is quite evident. In this context, the state of air pollution needs no further explanation.

Industrial plants, although not the sole polluters of the air, are major polluters. Of the 10 ministries financing investments in the field of air pollution control, the bulk of outlays issues from plants under the Ministry of Metallurgy and the Ministry of the Power Industry and Nuclear Power, which in recent years covered at least one-half to over three-fourths of the combined investment outlays.

Investment outlays for the neutralization and management of industrial waste from 1975 to 1979 respectively amounted to: 898 million zlotys, 1.346 billion zlotys, 1.366 billion zlotys, 1.713 billion zlotys and 1.596 billion zlotys. Most of these were financed by the Ministry of Metallurgy, the Ministry of the Power Industry and Nuclear Power, the Ministry of the Chemical Industry, the Ministry of Mining and the Ministry of Forestry and the Timber Industry. These participated in investment outlays in this area practically in their entirety. Especially noteworthy is the large share contributed to investment outlays by the Ministry of Forestry and the Timber Industry, in which waste that is the least harmful to the environment (i.e., it yields readily to soil biomineralization) is used to good advantage.

5. Environmental protection and development and the rational utilization of environmental resources is a field in which the use of cost effectiveness is possible but very difficult.

In analyzing the effectiveness of specific endeavors in the field of environmental protection, we should compare outlays borne in the implementation

of a specific pollution control venture with the results attained in its implementation. In general, cost effectiveness is limited in regard to product [goods and services] to minimizing outlays in order to achieve a specific result, e.g., the attainment of a specific degree of sewage neutralization or a reduction in dust emissions.

Cost effectiveness accounting of endeavors in the field of environmental protection is a problem of extreme complexity. This complexity emanates primarily from the fact that it is impossible to put a price on many of the effects brought about by the improvement in environmental conditions. It is likewise difficult to gauge the cost to society of the worsening of the quality of life within the environment. Attempts are being made, especially in capitalist countries, to put a price on the worth of health and even human life (Cost-Benefit Analysis), but how do we price the value of the matchless beauty of nature and the song of birds? The fact that this is of great value --and not merely aesthetic value--is confirmed by income from tourism in countries and regions with especially attractive landscapes.

An evaluation of the investment variants under investigation, using currently applied methods of cost effectiveness accounting for investments actually includes the analysis of so-called non-cost-effectiveness factors; however, this is merely a descriptive-type analysis. A more complete expression of the socioeconomic effects of the implementation of ventures in the area of environmental protection is made possible by a Cost-Benefit Analysis. Within the C-B-A framework, effects that are difficult, even impossible to measure (e.g., human life) are quantified. When pricing elements of certain effects of these ventures are lacking, their theoretical valorization is carried out with the use of shadow prices or accounting prices. Having placed a value on the costs and benefits of protective ventures, the economist is in a position to succeed in revising the worth of the effects of cost-benefit analysis, taking into consideration all the facts including those recognized as immeasurable.

6. Poland is one of the poorest countries in Europe in terms of water outflow; during the last 30-year period, it amounted to 1,600-2,600 cubic meters per person per year. Of the approximately 14 billion cubic meters of water consumed in 1979 by the needs of the national economy, 70.6 percent was used for industry, 11.5 percent was used for agriculture and forestry and 17.3 percent went for the municipal economy. Water consumption in the national economy increased in the 1970's by more than 40 percent. Approximately 85 percent of the water consumed was obtained from surface-water intakes, 13 percent was underground water and 2 percent was mine water.

In 1979, approximately 2 billion cubic meters of sewage (43 percent) were discharged with no reduction in pollutants (untreated sewage). Of this, 32 percent was industrial sewage and 55 percent was municipal sewage. The situation regarding providing sewage treatment plants with treatment equipment that guarantees the adequate reduction of pollutants is unsatisfactory. Sewage treatment plants cannot neutralize all of the sewage flowing into them. Only about one-third of them have received sewage in amounts not exceeding their capacity, and in nearly half of all



municipal sewage plants, the hydraulic load has exceeded their treatment capabilities by at least 50 percent.

Most treatment plants do not achieve satisfactory results in the liquidation of pollutants. This results primarily from the fact that of the 424 sewage treatment facilities in 350 cities, 155 have had available only equipment for mechanical treatment. Thus, not only, has sewage from the 453 cities that do not have treatment plants been discharged untreated, but so-called "treated" used waters have become a serious threat to the quality of surface waters and to the biological life in these waters.

In comparison with the situation in 1973, when, of the 7.3 billion cubic meters of discharged sewage (including 63 percent cooling waters), approximately 2.2 billion cubic meters was sewage that required treatment, their volume increased more than two-fold in 1979. Unfortunately, this was not accompanied by a corresponding increase in the level of their neutralization. The decline in the share of treated sewage discharged into surface waters from over 70 percent in 1973 to less than 40 percent in 1979 indicates this. The wholly positive phenomenon of the increase in quality control of discharged and treated sewage is significant in the worsening of these ratios.

A reduction in water consumption and a decline in the discharging of pollutants may be stimulated using economic instruments, as shown by examples from other countries. The 1974 water law, introducing charges for water consumption for industrial use, has possibilities in this area. The water management fund was created on the basis of these fees. Currently they come into the Environmental Protection Fund. However, the above-mentioned lack of processing capacity in construction has meant that the bulk of monies collected in this fund has not really been able to be used.

Industrial plants and heating plants are considered to be especially harmful to the purity of the air. Calculated at 931 in 1971, they emitted an average of 2.2 million to 2.4 million tons per year of dust pollutants during the 1970's. While this amount did not change significantly in particular years, the amount of gas pollutants emitted continually increased. In 1973 it amounted to 2.5 million tons; in 1975 it exceeded 3 million tons, and in 1979 it approached 5 million tons. The amount of pollutants retained in reduction systems, which in 1978 amounted to 21.8 million tons of dust and 0.7 million tons of gas pollutants, in 1979 amounted to 25.7 million tons and 0.7 million tons respectively. In 1979, the amount of dust pollutants retained (by 0.03 million tons). This was surely caused by systems shutoffs due to the power shortage. Thus, the level of neutralization of dust pollutants increased from 91.4 percent in 1978 to only 91.5 percent in 1979; for gas emissions retained this indicator declined from 13.5 percent to 12.2 percent.

At the end of 1979, at least 846 million tons of industrial wastes harmful to the environment were stored in storage grounds, dumps and sedimentation ponds. In recent years, approximately 40,000 tons of wastes were added each year. Nearly 90 percent of this waste was collected by plants discharging at least 2,000 tons of wastes annually, while at least half came from plants with post-production waste of more than 20,000 tons per year.

The area of the storage grounds, dumps, dumping grounds and sedimentation ponds in which solid post-production waste was stored amounted to 8,429 hectares at the end of 1979, or nearly 2,000 hectares more than in 1975. 1979, 214 hectares (one-fortieth) were recultivated.

Municipal wastes disposed of in dumping grounds and sedimentation ponds amounted to nearly 50 million cubic meters in 1979, of which two-thirds was solid waste and one-third, liquid waste.

Municipal wastes pose a special problem due to the poor sanitary condition of the dumping grounds at which they are stored. At the end of 1979, the volume of post-consumption waste at 1,227 supervised dumping grounds amounted to 35 million cubic meters, or 1 cubic meter per capita. These dumping grounds, occupying 2,267 hectares, of which 636 hectares are located on municipal lands and 589 hectares are found in rural areas (primarily in the vicinity of cities), represent an unsatisfactory standard of environmental hygiene. In 1979, the standard of environmental hygiene in 40 percent of them was defined as decidedly bad.

Of the 31.2683 million hectares of land in our country, cropland occupies 61.2 percent, forests and afforested land--28 percent, land under water--2.6 percent, mining land--0.1 percent, transportation land area--3.0 percent, community area--2.6 percent and wasteland and other land--2.4 percent.

There is in Poland the continual process of a reduction in the area of cropland. By comparison with 1946, approximately 1.3 million hectares were withdrawn for non-agricultural purposes; this area declined from 0.85 hectares per person in 1946 to approximately 0.5 hectares at present. In order to limit this inevitable phenomenon, charges have been introduced for the withdrawal of land from agricultural and forest use. Unfortunately, 6 years after the law concerning the protection and recultivation of lands took effect (1971), the phenomenon of changing over lands for non-agricultural and non-forest purposes had not declined. For this and other reasons, these charges were increased about three-fold in 1978, causing a decline in the area of land withdrawn for non-agricultural and non-forest purposes had not declined. For this and other reasons, these charges were increased about three-fold in 1978, causing a decline in the area of land withdrawn for non-agricultural and non-forest purposes from 27,000 hectares in 1977 to less than 17,200 hectares in 1979. Most of these lands were soils and forest habitats of low quality, which the highly differentiated level of charges favors (from 1.6 million zlotys down to 0 zlotys, in the case of the withdrawal of wasteland).

The area of lands in need of recultivation (more than 108,000 hectares in 1979), and the low level of their recultivation and farming utilization (28,600 and 24,800 hectares in 1979) arouse concern. Moreover, the monies in the soil recultivation fund, amounting to billions of zlotys, are little used. For example, in 1979, of the nearly 4 billion zlotys paid in fees for the withdrawal of agricultural farmlands and forest lands for non-agricultural and non-forest purposes, less than 2.9 billion zlotys was used from the Soil Protection and Recultivation Fund.



In summarizing these considerations, we should emphasize that each country (Poland included) and each people as a whole can defer making trifling outlays for environmental protection in favor of increasing economic growth, expressed in terms of the increased production of per capita goods. The only alternative to such postponement can be the worsening of environmental quality, whose future restoration, if possible, cannot but cost considerably, more. The avoidance of pollution (deformation) of the environment and its rehabilitation, restoring the biological balance, are technically possible, socially necessary, ecologically indispensable and economically profitable, although we are not yet able to measure this profitably in full. The necessity to hasten growth or to get out of the economic crisis generally means that, due to the multitude of other needs, outlays for environmental protection are treated as residual and do not correspond either to needs or to the limited potential of our economy, especially during the recent period. Life in a healthy natural environment that is pleasing both to eye and ear is a *sine qua non* of the quality of life, properly understood. This is something we often fail to perceive under conditions of daily privation.

### Planning System

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[Article by Edward Sitek]

[Text] In January 1980, the Sejm of the PRL [Polish People's Republic] passed a law concerning environmental protection and development that became binding 30 September 1980.<sup>1</sup> This law defines the duties of state organs economic units, social and trade organizations, and private individuals in the area of environmental protection. It sanctions the inclusion of tasks associated with environmental protection in national socioeconomic plans and plans of territorial development, an idea introduced recently into planning practice. It likewise imposes the obligation of taking into consideration aspects of environmental protection in the activity of state organs, organizational units and social organizations. According to the provisions of the law, the tasks and means ensuring effective environmental protection and the elimination of the consequences of actions having a negative effect on the environment are considered to be an integral part of the endeavors stipulated in national socioeconomic plans.<sup>2</sup>

The purpose of this article is to present the more important problems related to the inclusion in socioeconomic plans of the tasks of and the means indispensable for environmental protection on the basis of prior experiences in this area and anticipated changes in the planning system.

Tasks concerned with the protection of the natural environment have been marked out separately in national socioeconomic plans only recently. Within the broader scope, planning efforts in the area of environmental protection were initiated in Poland in 1973. At that time, a Government Team of Experts began work on a comprehensive evaluation of the current state of the environment, as well as on a forecast of changes and on directions of activity

in the future. This team prepared a document entitled "A Comprehensive Program of Environmental Protection in Poland to the Year 1990." On the basis of this document, the Ministry of Administration, Local Economy and Environmental Protection, the leading ministry in this sphere of operation, prepared "Program Assumptions in Environmental Protection in Poland to the Year 1990."<sup>3</sup>

Next, in accordance with the forecast-program-plan sequence used in planning practice, a portion of the tasks specified in the program for the forecast period was comprised by the national socioeconomic plan for the years 1976 through 1980. Beginning in 1976, tasks in the area of environmental protection were likewise indicated separately in yearly plans. Investment tasks serving the following goals were formulated separately.<sup>4</sup>:

- air pollution control;
- water pollution control;
- the neutralization of industrial waste and land recultivation,
- forest pollution control,
- soil pollution control.

Plans in the area of air pollution control, water pollution control and waste management under the planning system in use until now were drawn up summarily by the Ministry of Administration, Local Economy and Environmental Protection on the basis of materials from the ministries and voivodship offices. In the area of forest pollution, the plan was drawn up summarily by the Ministry of Forestry and the Timber Industry on the basis of materials from the voivodship offices and the interested ministries. In the area of soil pollution control, the plan was drawn up summarily by the Ministry of Agriculture on the basis of data from the voivodship offices and its own materials.

Tasks in the area of environmental protection specified for economic units embrace, e.g.:

- the construction of new sewage treatment plants or the modernization and expansion of existing treatment plants operated by economic units;
- participation in the construction of group or municipal treatment plants;
- the installation of dust and exhaust gas treatment equipment;
- the construction of storage grounds for industrial waste;
- the recultivation of exploited lands.

Prior experience in the area of including tasks and means ensuring environmental protection in socioeconomic plans is not extensive. Nonetheless, certain shortcomings in practice have become evident in this area. Very generally these include, on the one hand, excessive detailing in specifying tasks at the central level regarding elements of the environment and the fields of activity encompassed in planning, and on the other, the omitting of parts of tasks or the funds indispensable for ensuring the protection of other environmental elements or affecting other fields of activity in which problems of environmental protection occur.

In addition to our previous experience, doubtless the introduction of economic reform, which envisages changes in the system of planning, will bring many new elements into the inclusion of tasks associated with environmental protection in socioeconomic plans. In the draft of published reform assumptions<sup>5</sup> and in many statements on the subject in the press it is stressed that scrupulous attention to detail in specifying tasks and means should be avoided in central planning. Central planning should concentrate on the development of longterm state economic policy, on establishing the rate and proportions of development and on insuring the conditions of harmonious development of the economy and the entire social organism. The autonomous, self-governing enterprise is to be a key element in the economic system. The command-distribution system should be replaced by a set of economic instruments and regulations of the law. These assumptions were partially put into practice by Council of Ministers resolution No 118/80 dated 17 November 1980, concerning changes in the system of directing state enterprises in 1981. They leave a certain area of matters concerned with environmental protection in the exclusive, autonomous power of enterprises. General legal regulations create a sufficient foundation for the implementation of many tasks linked with environmental protection.

An analysis of the tasks emanating from the law concerning environmental protection and development against the background of the assumptions of the new economic reform demonstrates however, that legal regulations will not be sufficient to enable enterprises to resolve all problems associated with environmental protection independently. There will be external circumstances connected with the implementation of some tasks issuing from the law, which enterprises will not be able to overcome. Moreover, the autonomy of enterprises in accordance with the assumption of economic reform must mean their increased interest in attaining good financial results. Consequently, if the fines stipulated in legal regulations for violation of the environment are lower than the implementation costs of tasks to liquidate environmental threats that are occurring, these tasks will be postponed by enterprises under various pretexts. Thus, we may state justifiably that in some cases, legal regulations in the area of environmental protection will not represent a sufficient force, if the implementation of tasks is not secured from the financial, material and organizational aspects.

Therefore, the modification of the planning system in the area of environmental protection should aim in the direction of limiting the detailed specification at the central level of tasks for enterprises. At the same time, it should move into the direction of solving problems of securing the financial and material means indispensable for the implementation of tasks issuing from the law, as well as insuring the coordination of the tasks whose execution is conditioned by external factors.

As we examine the problem of planning tasks issuing from the law on environmental protection and development from a systems approach, we are able to isolate the following elements characterizing the goals, the kinds of means and the operating conditions vital to planning decisionmaking in this area:

1. Goals subset:

- air pollution control,
- water resource pollution control,
- neutralization of industrial waste and recultivation of lands,
- land surface pollution control (forests and soil),
- noise and vibration pollution control,
- counteracting the threat of radiation;

2. Means subset:

- financial means,
- the processing capacity of building construction enterprises and other organizational units executing structures and installing equipment serving environmental protection,
- construction materials and mechanical equipment produced by industry for environmental protection needs,
- the foreign-exchange fund for the purchase of imported equipment;

3. Operating conditions subset:

- the existing state of environmental protection in economic units,
- the interdependence of tasks in the area of environmental protection and of other endeavors implemented simultaneously in particular economic units,
- the achievements in science and technology serving environmental protection,
- legal standards concerning economic activity:

4. Criteria for selection:

- the requirements for the protection of particular environmental elements issuing from binding regulations as well as existing conditions in the area that are also projected for the future,
- the economic effectiveness of possible alternative technological solutions.

By comparing the scope of current planning with the elements of the systems approach that create the subset of goals and the subset of means we see that not all elements of these subsets are embraced by socioeconomic planning on the national scale (see table 1).



Table 1: Elements of Planning Decisionmaking in the Area of Environmental Protection (Subsets: Goals and Means)

| <u>According to a Systems Approach</u> |   | <u>Currently Comprised by a Separate Part of the National Socioeconomic Plan</u>  |
|--|---|---|
| Goals Subset                           | Air pollution control   | Investment tasks serving these ends are included in planning  |
|  | Water resource pollution control  |   |
|  | Neutralization of industrial waste and recultivation of lands   |   |
|  | Land surface pollution control (forests and soil)   |   |
|  | Noise and vibration pollution control   | These goals are not included in the current system of planning  |
|  | Counteracting the threat of radiation   |   |
| Means Subset                           | Financial means   | There is a specified limit of investment outlays for the implementation of particular tasks   |
|  | The processing capacity of building construction enterprises and other organizational units executing structures and installing equipment serving environmental protection. | The maximum amount of outlays for building-construction work is specified, indirectly enabling an estimate of the amount of contractors' processing capacities needed |
|  | Construction materials and mechanical equipment produced by industry for environmental protection needs   | These means are not included in the current planning system   |
|  | The foreign-exchange fund for the purchase of imported equipment  | As above  |

With regard to the goals of environmental protection listed in table 1, the national socioeconomic plan currently does not isolate tasks concerned with noise and vibration pollution control and counteracting the threat of radiation.

Obviously not all tasks associated with noise and vibration pollution control and with counteracting the threat of radiation qualify for inclusion in the national socioeconomic plan in the area pertaining to



environmental protection. In accordance with currently binding regulations, there is the required use in new investment structures of such technological measures as would prevent the creation of noise or vibrations in, or their penetration of, the environment.<sup>6</sup>

The implementation of tasks whose goal is noise pollution control within new investment structures is thus a complementary part of the entire investment venture. In this case, the preparation and implementation of tasks in the area of noise pollution control are linked closely with the preparation and implementation of the basic investment. The financial means for the implementation of these types of tasks are included in the summary statement of costs for the entire investment. The inclusion of the basic investment in the socioeconomic plans means that the financial and material means for the environmental protection tasks implemented within the framework of this investment will be guaranteed as well. Thus, it is not necessary to isolate this type of task in the part of the socioeconomic plan that concerns environmental protection issues.

Of course, the above statement concerns not only tasks associated with noise pollution control, but also tasks for protecting the environment against other disturbances and pollutants.

In plans now being prepared, tasks projected for implementation in new structures are designated by the symbol N, while tasks projected for implementation in existing structures are designated by the Symbol S. However, this differentiation is of no practical significance. Both types of tasks are treated alike. This evokes much controversy in the planning process, particularly in accounting for the implementation of tasks encompassed by the plan. When reports are made on the execution of the plan, there is no allowing for the fact that the implementation of environmental protection tasks in newly constructed units and structures is justifiable only when the basic investment is implemented. In this case, environmental protection issues are secondary; they become the consequence of actions aimed at achieving other, primary ends, and not ends in themselves. In the event that the implementation of a planned basic investment is postponed or abandoned, the construction of treatment equipment becomes pointless.

Thus, when recommendations are made concerning the tasks to be included in plans of environmental protection, what should be given primary consideration are not the requirements issuing from the currently planned construction or expansion of industrial plants and other structures, but the need to repair what was neglected in the past as well as the needs of environmental protection emanating from the noninvestment development of existing economic units. In many economic units, there is also the need to modernize or expand treatment equipment that is excessively worn out, unproductive or technically obsolete. Adequate financial and material means should be guaranteed in socioeconomic plans for the implementation of investment tasks consisting of the construction or installation of environmental protection equipment.

In the area of noise pollution control, to the extent that it is possible, planning should embrace those tasks whose implementation would limit pollution to the environment caused by the excessive diffusion of noise created in industrial plants built earlier, on transportation lines and in other structures. For example, a reduction in noise pollution may be attained by replacing noisy machinery and equipment with other, less noisy machinery and equipment, by enclosing or screening the sources of noise, by creating and managing protective zones so that the diffusion of noise in areas adjacent to the major sources of noise emission is checked and by isolating the route of noise diffusion with natural screens (earthen banks, green belts).<sup>7</sup> The financial and material means should be guaranteed for the implementation of such tasks.

The need to isolate tasks in the national socioeconomic plan in the area of radiation pollution control is not so express. Regulations specifying the method for protecting the environment against the negative effect of radioactive substances and equipment producing electromagnetic fields have been long-since binding and are enforced consistently. Tasks in this area are implemented by economic units within the framework of ongoing exploitational activity, and in new investment structures they are a complementary part of the total venture.

In socioeconomic plans currently in preparation, of the elements in the means subset, the estimated costs of tasks in environmental protection credited to particular economic units are itemized, as is the limit of investment outlays in general and the limit of outlays for building-construction work associated with the implementation of these tasks within the given planning period. The specification of the limit of outlays in general is equivalent to the allocation of the financial means for the implementation of investment tasks detailed in the environmental protection plan. Limiting outlays for building-construction work makes possible the designation of the processing capacity of building-construction enterprises in the construction plan, as well as the inclusion in the raw and other materials balance of needs in the area of building materials of general designation.

Practice demonstrates that the current system of construction planning and organization does not insure the implementation of many investment tasks in the area of production of the natural environment. In many cases, tasks outlined in the socioeconomic plan are not implemented due to the lack of contractors. Large building-construction enterprises unwillingly undertake environmental protection tasks whose estimated cost value is relatively small in comparison with other investment tasks. There is a shortage of small, specializing enterprises that could implement environmental protection tasks. Thus the demand should be made that the newly introduced economic reform favor the creation of small and average size building-construction enterprises in all voivodships. Of course, the advisability of creating such enterprises emanates not only from environmental protection needs, but is also warranted from the viewpoint of other needs (e.g., housing construction, municipal construction and social construction).

Guaranteeing execution does not exhaust all of the means indispensable for the implementation of environmental protection tasks. Deliveries of the technical equipment needed for reducing environmental pollutants are indispensable for the execution of many tasks. The impossibility of purchasing such equipment produced domestically and the unavailability of a foreign-exchange fund for purchasing imports until now has been another factor hampering the implementation of tasks in the area of environmental protection.

In the planning system used until now, production tasks for domestic industry concerning deliveries of technical equipment serving environmental protection needs were not isolated; nor was the foreign-exchange fund for purchasing such equipment through import. The problems of meeting the need for technical equipment to reduce pollutants, of insuring deliveries of the necessary equipment by domestic industry and of securing foreign-exchange funds to import equipment not produced domestically should not be omitted in the new system of planning.

Environmental protection plans currently in preparation essentially include only investment tasks. Tasks emanating from environmental protection needs manifested in other types of activity carried out by economic units are not included in planning. Environmental protection problems occur in various fields of activity conducted by ministries, organizations and economic units.

Environmental protection tasks of ministries and economic units synthesized in article 55 of the law (see table 2) show that, apart from the planning and implementation of investments, the more important fields of activity in which environmental protection problems occur include in particular: operational activity and scientific-research activity.

In the operational activity of buildings there are mainly problems of the proper functioning of environmental protection equipment as well as questions of economic usage or the neutralization of waste that threatens the environment.

Table 2: Tasks Specified in Article 66 of the Law Concerning Environmental Protection and Development

| Contents of the task according to article 66 of the law                       | The field of activity of ministries and economic units in which the task is manifested |
|---|--|
| Locating the means of production in a manner least harmful to the environment | Territorial programming<br>Establishing the location of an investment                  |

(Continued on following page)

|  |  |
|--|--|
| Insuring in economic activity under preparation or being conducted the required protection of natural elements or their parts and their restoration to their natural state | <p>The preparation and implementation of an investment</p> <p>Operational activity</p> <p>The planning of endeavors in the environmental protection area</p> |
| Concern over the landscape values of the environment   | <p>Establishing the location of an investment</p> <p>Preparing the design documentation</p>  |
| The use in economic activity of technologies and technological solutions creating the least possible threat to or pollution of the environment                             | <p>The preparation of the design documentation of the investment</p> <p>The introduction of technological innovations</p>                                    |
| The construction or installation and guarantee of the efficient functioning and operation of environmental protection equipment  | <p>Investment implementation and design</p> <p>Operational activity</p> <p>The planning of ventures in the area of environmental protection</p>              |
| The installation of control-testing apparatus and the carrying out of the indispensable tests  | Operational activity   |
| Making allowances for the requirements of environmental protection in designed, constructed and produced machinery, technical equipment and other products                 | <p>Scientific-research work and experimental-construction work</p> <p>Product construction design</p>  |
| The economic utilization of waste and sewage or their successful neutralization or liquidation   | <p>Operational activity</p> <p>The planning and implementation of ventures in the area of environmental protection</p>                                       |

(Continued on following page)



|  |   |
|--|---|
| Taking advantage of scientific and technological achievements, using economic, legal and organizational means for protecting the environment | Scientific-research activity<br>Legal-organizational activity |
|--|---|

The implementation of tasks associated with environmental protection within the framework of ongoing operational activity is financed out of turnover funds, the work safety and hygiene fund and the repair fund. The inclusion of such tasks in separate environmental protection plans would not be warranted due to their immediate nature. However, material-technical needs arise within the framework of this activity, especially in the area of specialized control-testing apparatus for making quality checks of separate environmental elements. Most of this equipment is not included in durable resources and is installed by economic units within the framework of operational activity. The problem of guaranteeing the possibility of the purchase of this type of equipment by interested economic units must be solved. This problem is identical to the above-mentioned problem of guaranteeing the possibility of the purchase of equipment for reducing pollutants of particular environmental elements.

In practice there is quite a severe shortage of control-testing apparatus for environmental protection needs. Existing production capabilities in domestic industry are not sufficient to cover needs in this area. Moreover, only certain kinds of control-testing equipment are produced domestically, and others must be imported. Given the existing situation, there emerges the demand for adopting solutions in the planning system to enable needs in the area of control-testing apparatus to be considered by domestic producers in their production plans and programs of production capacity development, as well as by units of foreign trade in import plans.

Within the framework of scientific-research activity, work is being implemented whose results, although they serve other purposes, may be utilized for the needs of environmental protection as well. Much work that has been undertaken serves environmental protection needs exclusively. It would be useful if the more important topics from the first group of efforts and all topics from the second group were considered in plans of technical progress. The designation of problems in preparation in the environmental protection plan and the specification of leading units would facilitate considerably the coordination of implemented efforts by particular scientific-research institutions. This is especially vital in light of the ever broadening international scientific-technical cooperation in the area of environmental protection problems.

Recommendations of great importance to the contents of socioeconomic plans follow from the need to limit the excessive emission of harmful substances into the environment, resulting from the use of unsuitable equipment or

technological processes by some industrial plants. In order to limit the harm done to the natural environment, it even becomes necessary to halt production activity in some plant departments. For example, the president of the city of Krakow, making use of powers defined in article 31 of the law concerning environmental protection and development and in paragraph 8 of a Council of Ministers decree dated 30 September 1980, concerning air pollution control, during the first few days of January 1981 ordered the Aluminum Works in Skawina to halt production in the aluminum electrolysis department. The purpose of this action was to liquidate the emission of fluorine and its compounds into the air. At the same time, the decision was made to close the viscose fiber plant at the Lodz "Anilan" plants and to halt the production of cellulose at the "Chemitex-Celwiskoza" Chemical Fibers Plants in Jelenia Gora, for the purpose of air pollution control.

The above decisions, doubtless right and warranted from the viewpoint of environmental protection, had major economic consequences. For example, halting production in the aluminum electrolysis department in Skawina means that this raw material will have to be imported until a high enough level of production is reached at the Aluminum Works in Konin. For 1981, import needs were initially set at approximately 20,000 tons of aluminum.<sup>9</sup> The closing of the cellulose plant in Jelenia Gora will mean a reduction in the production of bleached sulfite cellulose by approximately 24,000 tons a year.<sup>10</sup> These consequences could have been avoided if economic activity had been coordinated earlier with the requirements of environmental protection within the framework of socioeconomic plans of the appropriate ministries and enterprises.

We may conclude from the above that this type of task, both halting production activity and changing production technology in order to limit the harmful effect the industrial plant has on the natural environment, should be included in environmental protection plans, along with the designation of the means indispensable for the implementation of these tasks and for preventing the occurrence of negative economic consequences. A situation requiring halting production activity in some departments or removing some equipment from operation because of the requirements of environmental protection does not arise overnight. Including this type of intent in the plan creates an inducement for undertaking the appropriate endeavors enabling undesirable disruptions of economic activity to be avoided.

Both on the basis of previous experience and in light of the assumptions for modifying the planning system that are taking shape within the framework of the newly introduced economic reform, some observations suggest themselves regarding the sphere of planning of investment tasks in regard to plants and equipment for environmental protection at the central level and at intermediate levels.

Practice up to this time regarding the plant and equipment sphere of preparing investment plans in the area of environmental protection in the ministry system demonstrates a certain type of inconsistency that reduces itself primarily to the fact that in some cases less important tasks are specified in a plan being prepared at the ministry level and more crucial tasks are

omitted. For example, a plan of ventures linked with air pollution control is prepared for plants named individually in a directive issued by the Ministry of Administration, Local Economy and Environmental Protection. A plan of undertaking in the area of water pollution control is prepared for units that discharge 40,000 cubic meters or more of sewage annually into surface waters. Regarding industrial waste management, a plan is developed for plants that intend to implement investments, as well as for those plants that produce a total of 5,000 tons or more of waste per year. For plants not conducting investment activity in the area of waste management, only information concerning the amount of production waste used economically and the area of land being recultivated is published.<sup>11</sup>

Other economic units are not included in the planning of investment tasks in the area of environmental protection, although some of these may be very heavy sources of pollution of the natural environment. The failure to include tasks for these units in the environmental protection investment plan signifies--according to the currently binding economic-financial principles--that the means for the implementation of these tasks are lacking and, as a consequence, these sometimes significant sources of environmental pollution will remain so.

We conclude from the above that both the product [goods and services] area of tasks in the field of environmental protection currently included in planning and the sphere of the investment [plant and equipment] designation of these tasks must be modified.

It is indispensable that new principles be prepared concerning the degree of detailing and the method to be used for assembling the tasks and implementational means established at particular levels of management. These should take into consideration the general assumptions of economic reform, and in particular recommendations emanating from the assumption concerning the autonomy of enterprises and the increase in territorial self-government.

There is no doubt that tasks and means in the plans of economic units should be outlined in detail. As we enter a higher level of management, it is indispensable that the tasks and means be assembled in a manner insuring that the entire sphere of activity is included in the plan, and enabling the execution of the transfer of funds for implementation among the particular units in the event that a situation arises that is not anticipated in the course of preparing the plan.

Analyzing the conclusions drawn from previous experiences in the area of the planning of the tasks and means for environmental protection, and taking into consideration economic reform assumptions, we may conclude that the planning of tasks in the area of environmental protection regarding plant and equipment needs should lie within the power of local authorities. The ministry system is not suitable for this purpose; local authorities are more aware of needs in this area than ministries.

As noted above, the autonomy of enterprises must mean shifting the burden of planning in the area of environmental protection to financial matters. The financing of some tasks in environmental protection, especially tasks manifested in the sphere of ongoing operational activity, will be an element of operational costs for enterprises. Some of these tasks will also be financed out of enterprise funds derived from writing off amortization. However, enterprises will have to be allocated financial subsidies for the implementation of larger scale investment tasks.

According to the draft of economic reform assumptions,<sup>12</sup> infrastructural and nonproduction investments, which also include investments associated with environmental protection, should be financed out of funds from the central budget or from local budgets. Thus, with regard to tasks associated with environmental protection whose implementation requires outlays of financial means, the following principles may be adopted:

1. The central plan defines the amount of financial means for destruction to the particular voivodship authorities out of the central budget and out of funds for that purpose, such as: the water management fund, the environmental protection fund and the land protection and recultivation fund.
2. Local officials, supplementing the funds apportioned to them with their own funds if necessary, allocate them to particular economic units for the implementation of the specific tasks that are the more important priority tasks for the planning period, and whose implementation is secured from the material aspect and from the possibility of construction work.
3. Besides apportioning the financial means to voivodships, the central plan specifies by name the important tasks in terms of plants and equipment that call for the need to undertake ventures in other fields of economic activity and require intervoivodship coordination.
4. The balancing of financial needs at the central level and the preparation of a draft of the budget estimate of funds to be distributed among the particular voivodships and ministries lies within the power of the Ministry of Administration, Local Economy and Environmental Protection.

According to the assumptions of economic reform in the area of enterprise financing of investments and the financing of investments from voivodship budgets, there should be no limit set at the central level. These outlays should be specified in the central plans and a balance-sheet estimate should be given. These principles should likewise be applied regarding investments associated with environmental protection.

The financial means designated for environmental protection by enterprises out of their own funds, and by local authorities out of their budgets should not be restricted centrally, nor should they be omitted in macroeconomic accounting. In order for the percentage of the national income designated for the protection and rational development of the environment to be correctly determined, in the sumtotal of financial outlays for this purpose all components should be taken into account.



If the aforementioned planning solutions are adopted for usage, it would be indispensable to prepare and publish the financial principles of tasks associated with environmental protection being executed by enterprises, as well as an accounting of the subsidies received for this purpose.

The planning of financial means for environmental protection should be accompanied by the programing of material and organizational endeavors in this area. There is the need to create a model of the desirable situation and to outline ways for attaining this situation in activity associated with environmental protection. Hence the need for programing, consisting of the precise definition of the goals of the activity of a given system, the implementational means and the methods for achieving envisaged goals.<sup>13</sup>

Sometimes the concepts of program and plan are treated as equivalent in the literature on the subject. This results from the fact that both are the basis of future activity.<sup>14</sup> Although programs and plans regarding a given field of activity during a specific period have many common elements, they differ from the viewpoint of the degree of precision, the scope and comprehensiveness of dealing with questions, the manner in which they handle giving directives and their designation.

At the programing stage, an analysis of the existing situation is done and the conditions are described that must be fulfilled to insure that envisaged goals are reached. The results of this analysis are the foundation for the definition of indispensable tasks for implementation by organizations and economic units. Programs, which are the ultimate orientation of the plan, also indicate the more important conditions and limitations and the organizational endeavors that must be undertaken. Thus, program materials include much information of usefulness when planning decisions are made. However, they cannot replace plans, the contents of which emanates from a successive phase of concretization of proposals concerning tasks and implementational means.

Programs concerning environmental protection vary in character depending upon the subject area, the local range and the temporal scope.

Comprehensive programs of environmental protection in economic units that embrace all types of activity and outline the indispensable implementational means for this goal have much practical usefulness. Such a program facilitates the preparation of the set of tasks to be comprised by socio-economic plans, taking into consideration financing possibilities, the meeting of material-technical needs and the guarantee of execution. If economic units have comprehensive programs of environmental protection, the coordination of tasks in this field in the local system is likewise facilitated.

Of course, the advisability of having a comprehensive programs of environmental protection does not affect all economic units equally. The determining factor warranting such a program for an economic unit is the occurrence of sources of pollutants and the existing state of protection of particular elements of the natural environment.

In addition to comprehensive programs of environmental protection, problem programs devoted to the solution of selected environmental protection problems on the scale of the economic organization, the ministry or a specific area of the country are also useful. For example, we can name here a program of production development of treatment equipment and control-testing apparatus, a program of the economic utilization, neutralization or storage of toxic waste and a program of water retrieval from municipal sewage and its utilization for industrial purposes.

In programing efforts within the broad scope, information-type tools describing known methods of reducing pollutants, available treatment equipment, methods of the economic utilization or neutralization of waste and the like should be used.

Obtaining this type of information will help enterprises to prepare programs to streamline activity directed toward achieving results in the area of environmental protection which are required by legal regulations.

Special care is required on the part of the organs coordinating activity in the area of environmental protection in the order of the planning and programing procedure in a manner that insures the implementation of tasks emanating from the law concerning environmental protection and development, and that complies with the general assumptions of economic reform.

#### FOOTNOTES

1. See DZIENNIK USTAW 1980, No 3, item 6.
2. See article 5 of the law concerning environmental protection and development.
3. See B. Poplawski, "Protection and Development of the Polish Natural Environment during the 1970's," GOSPODARKA PLANOWA 1980, No 3, p 131.
4. See "Instructions for the Preparation of the Draft of the Socioeconomic Plan for 1981 and for the years 1981 through 1985," Council of Ministers Planning Commission, Warsaw 1980, p 70.
5. "Basic Assumptions of Economic Reform (a Draft)," TRYBUNA LUDU, January 1981, point 3.
6. See the law dated 31 January 1980, concerning environmental protection and development, article 49, paragraph 2, and the law dated 24 October 1974 "Building Law," DZIENNIK USTAW, 1980, No 38, item 229, articles 5, 13 and 53.
7. See A Podniesinski, "Podstawowe problemy ochrony srodowiska w Polsce" [Basic Problems of Environmental Protection in Poland], Warsaw 1979, p 157.

8. See a PAP communique published 5 January 1981 and an article by Professor Dr Engineer Wlodzimierz Surewicz published in TRYBUNA LUDU, 15 January 1981.
9. See TRYBUNA LUDU, 7 January 1981.
10. According to the data contained in the above-quoted article of Professor Dr Engineer Wlodzimierz Surewicz.
11. See "Instructions for the Preparation of the Draft of the Socioeconomic Plan for 1981 and for the Year 1981 through 1985," op. cit., p 73.
12. Point 44 of the above-quoted draft of economic reform assumptions.
13. See "Programowanie rozwoju gospodarczego" [Programing Economic Development], Warsaw 1975, p 64.
14. See, e.g., P. Sulmicki, "Planowanie i zarzadzanie gospodarcze" [Economic Planning and Management], Warsaw 1971, p. 157.

8536

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## CHICHONAL VOLCANIC ASH FLOATING TOWARD TUXTLA GUTIERREZ

### Communities Still Cut Off

Mexico City EXCELSIOR in Spanish 14 Apr 82 pp 1-A, 13-A, 33-A

[Article by A. Garza Morales, EXCELSIOR correspondent]

[Text] Pichucalco, Chis., 13 April--Soldiers today encircled the Chichonal volcano in order to prevent access to curious persons because of the danger from ashes and hot sand.

It was revealed that the geologist Salvador Soto Pineda who was in the municipality of Francisco Leon, is reported missing. He arrived in the area last week to study the eruptions.

Several army companies were not able to reach the camps and the district of Francisco Leon, where it is surmised that there are thousands of victims.

General Mario Murillo, commander of the 20th Military Zone, is coordinating the rescue tasks, aided by Red Cross, ISSSTE [Institute of Social Security and Services for Government Workers], Social Security, and Coplamar members.

The attempts that were made today to arrive by helicopter were thwarted, because the volcano continues to emit dust and a cloud of ashes covers a surface of more than 13 kilometers.

It is not possible to go there by land, because the sand prevents this, and also the heat that the volcano discharges scorches the soles of the soldiers' boots. The fate of people trapped since this past 28 March, when the volcano first erupted, is not known. Clouds of dust continue to float toward Tuxtla Gutierrez and the Gulf of Mexico. It is not possible to predict when the eruptions will end and when the smoke will stop coming out.

A group of army parachutists is ready to be dropped over Francisco Leon when weather conditions make this possible.

This morning, at 0330 hours, there was another eruption, but a more moderate one than that of 28 March, and a slight earthquake was felt in Villahermosa.



The military command reported that the zone will continue to be closed until access is possible.

At present there are 33,000 refugees in various shelters located in Tabasco. Some are in the assembly room of the Tomas Garrido Canabal Park and in the Plaza de Toros in Villahermosa. There are also some in school buildings in Macuspana, Cardenas, and in places in Chiapas.

No one will be able to go to the volcano area, unless he is part of the army rescue squad.

In Villahermosa the governor of Tabasco, Leandro Rovirosa Wade, is coordinating the administration of assistance to victims.

#### The STPRM [Mexican Petroleum Workers Union] Reverses Itself

The Mexican Petroleum Workers Union has rescinded its offer to grant a thousand positions to the victims and to make possible their resettlement in various localities of the country, since the towns in which they lived have been almost completely destroyed. Those most affected are Chaputenango, El Volcan, Guayabal, Guadalupe Victoria, Teapa, and La Libertad.

The government of Tabasco is distributing food, clothing, and medicine to the refugees.

It is estimated that about 2 more weeks will pass before the volcano allows the return of the rural people to what remains of their homes. Instructions have been given to divide construction materials among the victims and also to pay them wages for their masonry work.

According to Juan Sabines, governor of Chiapas, there are about 45,000 heads of family without employment, who before the catastrophe worked on cacao tree and banana tree plantations and who gathered fruit.

Cattle ranches were also greatly damaged, and even though the rain that fell yesterday somewhat cleansed the pasture grounds that were covered by ashes, fodder is being received from other entities to save the cattle.

Manuel Aguirre Bravo, chief of the SAHOP [Secretariat for Human Settlements and Public Works] in Chiapas, said yesterday that seven small communities--whose population has not yet been precisely determined--were buried by the ashes, sand, and stone hurled by the Chichon<sup>al</sup> volcano. The erupted material was 10 meters thick and its temperature exceeded 200 degrees, which is why the rescue and salvage squads have not been able to reach the communities.

He also said that President Lopez Portillo has allotted 90 million pesos through the Unilateral Coordination Agreement (Federation-States) to repair the damages caused by the eruptions in Chiapas.

This sum will be allotted to the towns of Pichucalco, Ixtacomitan, Rayon, Pueblo Nuevo, Tapilula, Bochil, and Totol.

Aguirre Bravo explained that, in cooperation with the Airports and Auxiliary Services organization, the cleaning of the Llano San Juan Airport in Tuxtla Gutierrez is being continued, where it is foreseen that air operations will be resumed on Friday.

Engineer Ruben Valenti Fuentes, chief of the SAHOP Center in Tabasco, reported that the urban infrastructure in the towns of Teapa, Tacotalpa, and Jalapa will be expanded in order to shelter the victims.

Also in that entity the cleaning of the roads, such as the Villahermosa-Frontera, Cardenas-Comalcalco, and Macuspana-Ciudad Pemex roads, is going on.

#### Status of Volcano Uncertain

Mexico City EXCELSIOR in Spanish 14 Apr 82 p 13-A

[Article by A. Garza Morales, EXCELSIOR correspondent]

[Text] The first technical report made known yesterday by the Geophysics Institute of the UNAM [National Autonomous University of Mexico] states that there is great uncertainty concerning the future activity of the Chichonal volcano, since on the one hand it may decrease gradually in size, or it may increase until it reaches explosive stages, attaining at least the same magnitude as at the beginning.

From the point of probability, 7 out of every 10 volcanos will become explosive again; 3 will not. It has been observed that in the case of those that give evidence of new activity, the explosive periods occur after weeks (?) of slight activity.

The report recommends that the volcano be closely watched for several months, especially within a radius of 15 kilometers.

With respect to the eruptive history of the Chichonal volcano, the report says that it has been active since the end of the Pliocene epoch or the beginning of the Pleistocene epoch; that is, for some 500,000 or 700,000 years.

The most recent activity was reported in 1930, at which time seismic activity and an increase in fumarole activity (sic) were observed. There are also unconfirmed reports that there was some very slight activity about the middle of this past century.

At the present time, the eruptive column was more than 10,000 meters high and erupted at supersonic speed in its first stage. Its ashes are spreading chiefly to the north, owing to the prevailing winds and are 12 centimeters thick in Macuspana (40 kilometers north of the volcano) and 5 centimeters in the city of Villahermosa (80 kilometers north of the volcano).

8255

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# STRIKE AT WATER PURIFICATION PLANT HURTS PARIS WATER SUPPLY

Paris LE POINT in French 5-11 Apr 82 p 101

[Article by Stephane Bugat: "Strike: Blackmailing Pollution"<sup>7</sup>

[Text] All it took to once again expose the hostage Seine to pollution was the shutdown of the Acheres purification plant due to a strike.

Two million cubic meters of wastewater [have been] discharged daily since the Acheres purification plant was put out of action by a strike; the Seine did not need such a misfortune.

It all began with complaints by employees of the technical service of water and sanitation of the City of Paris. They work in the water treatment plants at Ivry, Orly, and Saint-Maur, as well as the Acheres purification plant, the largest and most modern of its kind in Europe.

In December 1981, the municipality proposed a cutback in the weekly work schedule from 39 hours 24 minutes to 37 hours 24 minutes. This schedule, along with the gradual introduction of a fifth shift, is in accord with the government's proposals for public service workers. It was approved unanimously by the joint technical committee, which includes CGT representatives.

A few days later, however, a new turn: The leaders of the same union, clearly pressured by their rank and file, called for a further reduction--to 33 hours 36 minutes.

Such a demand could only lead to a deadlock. Paris Mayor Jacques Chirac retorted: "There is no question of my answering this new demand, neither this year nor next year. There are limits to be respected," he said several times. The strike was therefore launched on 8 March.

Immediate result: The city must find an emergency supplier to meet the demand for drinking water. Parisians use some 800,000 cubic meters daily, of which 500,000 come from groundwater sources. To make up the 300,000-cubic-meter shortage, the city turned to the General Water Company, which supplies an intercommunal association of 144 suburban localities. It was simply a matter of invoking the permanent reciprocal agreement that calls for the capital and the intercommunal association each to come to the other's assistance in case of need.

The situation is rather more serious, however, in the case of Acheres. That plant treats the polluted water of Paris and its urban area (about 6 million people) virtually by itself. When it is not operating, the only alternative is to dump the sewage in the Seine, with obvious consequences. The only possible precaution is to spread out the dumping points. That is what has been done since 8 March.

It is true that we are not in a low-water period, when the river is particularly vulnerable. With the help of heavy rains, its current flow is 900 cubic meters/second, which helps to dilute the pollution. The technicians of the Seine-Normandy Basin Agency, who do analyses based on samples taken every 2 days, are not being alarmist about the situation.

However, can the dumping continue without damage? The Acheres strike committee doubts that it can. The committee adds that it will take several weeks before the purification plant can restore normal operations. And so on....

Actually, no one disputes that the work at Archeres is a thankless task, in addition to having the tiring schedule of three 8-hour shifts. Also, no one became offended when the union representative exclaimed: "We don't hear such a furor when factories dispose of products which cannot be treated. Nor does anyone talk about the problems of the Acheres workers, who are so filthy when they get home that they do not dare embrace their children." No one, not even Jean Tiberi, assistant to the mayor of Paris and the men in charge of municipal workers, who says he is untiringly open to negotiation.

Nevertheless, he does not want to hear any talk about a further reduction of working hours. He agrees that the Cheres workers should qualify under the "unhealthy work environment" system, which permits retirement at age 50. However, such a decision must come from the minister of the budget, and he has just said no. Does it thus require a catastrophe to remind the social partners of public service needs? "If the Seine had been low, the major would have negotiated," commented Claude Chalon, secretary general of the CGT water union.

Perhaps, but no one agrees to having the Seine held hostage by strikers. Nothing can justify blackmail by pollution.

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